TS ECET - 2024

Syllabus for COMPUTER SCIENCE AND ENGINEERING

MATHEMATICS (50 Marks)

Unit-I: Matrices

Matrices: Definition of Matrix, Types of matrices-Algebra of matrices-Transpose of a matrix-Symmetric, skew symmetric matrices-Minor, cofactor of an element-Determinant of a square matrix-Properties-Laplace's expansion-singular and non-singular matrices-Adjoint and multiplicative inverse of a square matrix-System of linear equations in 3 variables-Solutions by Cramer's rule, Matrix inversion method-Gauss-Jordan method.-Partial Fractions: Resolving a given rational function into partial fractions. Logarithms: Definition of logarithm and its properties, meaning of 'e', exponential function and logarithmic function.

Unit–II: Trigonometry

Properties of Trigonometric functions– Ratios of Compound angles, multiple angles, sub multiple angles – Transformations of Products into sum or difference and vice versa. Properties of triangles: sine rule, cosine rule, tangent rule and projection rule. Solution of a triangle when (i) three sides (SSS), (ii) two sides and an included angle (SAS), (iii) one side and two angles are given(SAA). Inverse Trigonometric functions, Hyperbolic functions.
Complex Numbers: Definition of a complex number, Modulus, amplitude and conjugate of complex number, arithmetic operations on complex numbers - Modulus-Amplitude form (Polar form) - Euler form (exponential form).

Unit–III: Analytical Geometry

Straight Lines–different forms of Straight Lines, distance of a point from a line, angle between two lines, intersection of two non-parallel lines and distance between two parallel lines. Circles-Equation of circle given center and radius, given ends of diameter-General equation- finding center and radius, center and a point on the circumference, 3 non-collinear points, center and tangent, equation of tangent and normal at a point on the circle. Conic Section – Properties of parabola, ellipse and hyperbola – Standard forms with vertex at origin and axis along co-ordinate axes only, simple problems.

Unit–IV: Differentiation and its Applications

Functions and limits – Standard limits – Differentiation of sum, product, quotient of functions, function of function, trigonometric, inverse trigonometric, exponential, logarithmic, Hyperbolic functions, implicit, explicit and parametric functions–Derivative of a function with respect to another function-Second order derivatives – Geometrical applications of the derivative(angle between

curves, tangent and normal)–Increasing and decreasing functions–Maxima and Minima(single variable functions) using second order derivative only physical application – Rate Measure - Partial Differentiation–Partial derivatives up to second order–Euler's theorem.

Unit–V: Integration and its Applications

Indefinite Integral – Standard forms – Integration by decomposition of the integrand, integration of trigonometric, algebraic, exponential, logarithmic and Hyperbolic functions– Integration by substitution –Integration of reducible and irreducible quadratic factors – Integration by parts– Definite Integrals and properties, Definite Integral as the limit of a sum – Application of Integration to find areas under plane curves and volumes of Solids of revolution– Mean and RMS values, Trapezoidal rule and Simpson's 1/3 Rule for approximation integrals.

Unit–VI: Differential Equations

Definition of a differential equation-order and degree of a differential equation- formation of differential equations-solution of differential equation of the type first order first degree, variable-separable, homogeneous equations, exact, linear differential equation of the form dy/dx+Py=Q, Bernoulli's equation, 2^{nd} order linear differential equations with constant coefficients both homogeneous and non-homogeneous and finding the Particular Integrals for the functions e^{ax}, sin ax, cos ax, ax^2 +bx+c (a,b,c are real numbers).

Unit–VII: Laplace Transforms

Laplace Transforms (LT) of elementary functions-Linearity property, first shifting property, change of scale property, multiplication by t^n and division by t - LT of derivatives and integrals, Unit step function, LT of unit step function, second shifting property, evaluation of improper integrals, Inverse Laplace transform (ILT)-shifting theorems, change of scale property, multiplication by s^n and division by s, ILT by using partial fractions and convolution theorem. Applications of LT to solve linear ordinary differential equations up to second order with initial conditions.

Unit–VIII: Fourier Series

Fourier series, Euler's formulae over the interval (C, C+2π) for determining the Fourier coefficients. Fourier series of simple functions in (0, 2π) and (–π, π). Fourier series for even and odd functions in the interval (–π, π) – Half range Fourier series – sine and cosine series over the interval (0, π).

PHYSICS(25 Marks)

Unit-I: UNITS, DIMENSIONS AND MEASUREMENTS

Physical quantity – Fundamental and derived quantities, unit – definitions – system of units – Advantages of S.I. units.
Dimensions and dimensional formula – definitions, units and dimensional formulae for physical

quantities, Dimensionless quantities, Principle of homogeneity, Applications of dimensional analysis – Checking the correctness of physical equations – conversion of unit from one system to another system – problems on density, force and energy.

Unit-II: VECTORS

Scalar and Vector quantities – definition and examples, representation of a vector, Classification of vectors - Proper vector, Equal vectors, Unit vector, Negative vector, null vectorand Position vector, Resolution of avector.
Lami's theorem, Parallelogram law of vectors – statement- expression for magnitude and direction of resultant vector –derivation-, Representation of a vector in unit vectors **i**, **j** and **k**. – numerical problems.
Scalar product of vectors- application to work done by force and power – properties of scalar product. – Numerical problems.
Vector product of vectors– Right hand thumb rule and righthand screw rule - application to torque - properties of vector product - Application to area of parallelogram and triangle -numerical problems.

Unit-III: MECHANICS

Concept of Friction - Normal reaction, Angle of friction, Motion of a body over a rough horizontal surface - expressions for Acceleration, Displacement, Time taken to come to rest - derivations, inclined plane - Motion of a body over a smooth inclined plane and rough inclined plane–forces acting on the body -angle of repose, Application of friction – brake systemin bicycle– numerical problems
Projectile motion – definition – examples, Horizontal projection - Oblique projection, Expression for path of a projectile in oblique projection –derivation, Maximum height, Time of ascent, Time of descent, Time of flight, Horizontal range and maximum horizontal range in oblique projection– derivations, numerical problems
Circular motion – definition of angular displacement, angular velocity, angular acceleration, frequency and time period, Relation between linear and angular velocity – derivation – related numerical problems,Central force – examples, Expressions for centripetal and centrifugal forces (no derivation), Applications of centripetal and centrifugal forces - Banking of roads and its expression, bending of cyclist and principle of centrifuge - related numerical problems.

Unit-IV: PROPERTIES OF MATTER

Elasticity – Elastic body –definition - examples, Stress and Strain – definitions and expressions, types of stress and strain, elastic limit - Hooke's law – statement – modulus of elasticity, significance of stress and strain curve -Young's modulus – Derivation, numerical problems.
Surface tension - Capillarity –angle of contact – definition- examples for capillarity- Formula for Surface tension based on capillarity (no derivation), effect of temperature and impurity on surface tension, applications and illustrations of surface tension, numerical problems.
Viscosity - Newton's formula for viscous force – derivation - Coefficient of viscosity - Poiseuille's equation (formula only), Effect of temperature on viscosity of liquids and gases, applications of viscosity, numerical problems.
Concept of fluid motion –streamline and turbulent flow,Reynold's number, equation of continuity, Bernoulli's theorem (only formula) and applications - related problems.

Unit-V: CONSERVATION LAWS AND ENERGYSOURCES

Work, Power and Energy – explanation, Potential Energy and Kinetic energy–examples – expressions for Potential energy and Kinetic energy– derivations, Work-Energy theorem – derivation, Law of conservation of energy – examples, Law of conservation of energy in the case of freely falling body – proof – Illustration of conservation of energy in the case of simple pendulum, related problems

Unit-VI: HEAT

Heat – thermal expansion of solids – Coefficients of expansions, Boyle's law – statement, concept of absolute zero - Absolute scale of temperature, Charles' laws, Ideal gas equation – derivation - value of universal gas constant 'R', Gas equation in terms of density, Isothermal and Adiabatic processes - Differences between isothermal and adiabatic processes, Internal energy and External work done, Expression for work done – derivation, first law of thermodynamics –application of first law to isothermal and adiabatic processes, second law of thermodynamics, specific heats of a gas, related numerical problems.

Unit-VII: SIMPLE HARMONIC MOTION

Periodic motion - Simple Harmonic Motion (SHM)– definition – examples, Conditions for SHM, Time period, frequency, amplitude and phase of a particle in SHM, Expressions for Displacement, Velocity, Acceleration, Time period and frequency of a particle executing SHM – derivations,
Ideal simple pendulum – time period of simple pendulum –derivation, laws of simple pendulum, Second's pendulum- related numerical problems

Unit-VIII: SOUND

Stationary waves, beats - applications of beats, echo –definition - applications - relation between time of echo and distance of obstacle,
Doppler effect in sound (no derivation, formulae only) – list the applications – ultrasound and radar in medicine and engineering- –derivation- Reverberation and time of reverberation - Sabine's formula - Free and forced vibrations - Resonance - Conditions of good auditorium, noise pollution – causes, effects and methods to minimize noise pollution, related numerical problems.

Unit-IX: MAGNETISM AND ELECTRICITY

Basics of magnetism, Coulomb's inverse square law in magnetism, moment of couple on a bar magnet placed in a uniform magnetic field – derivation, expression for magnetic induction field strength at a point on the axial line of a bar magnet –derivation,
Kirchhoff's laws in electricity, Wheatstone bridge – balancing condition, application of Wheatstone bridge –Meter bridge,
Concept of electromagnetic induction - self-induction and mutual induction, Faraday's Laws, Lenz's law, principle and working of transformer-types of transformers, types of magnetic materials – dia, para and ferromagnetic materials, related numerical problems.

Unit-X: OPTICS

Light theories-dual nature, reflection, refraction, and interference,
Photo electric effect - Einstein's photo electric equation – Work function and threshold frequency - laws of photo electric effect - applications of photo electric effect – photo cell.

Unit-XI: MODERN PHYSICS

LASER – definition, Spontaneous emission and Stimulated emission –principle and working of LASER, characteristics of LASER- types of LASER, applications of LASER,
Total internal reflection, critical angle, conditions for total internal reflection, Principle and working of Optical fiber –types- Applications of optical fiber –
Nanotechnology, nano particles and nano materials-applications and devices, Superconductivity-basic concept-applications of Superconductors.

Unit-XII: SEMICONDUCTOR PHYSICS

Energy bands in solids- valence band- conduction band – forbidden gap – Energy band diagram of conductors, insulators and semiconductors – concept of Fermi level - Intrinsic semiconductors - examples - Concept of holes in semiconductors - Doping - Extrinsic semiconductors - P-type and N-type semiconductors, PN Junction diode – Forward Biasing and Reverse Biasing - Volt-Ampere (V-I) characteristics - Applications of PN diode - Diode as rectifier (half wave rectifier), Light Emitting Diode – principle and working, solar cell – principle and working.

CHEMISTRY (25 Marks)

UNIT-I: FUNDAMENTALS OF CHEMISTRY

Atomic Structure: Introduction – Atomic number – Mass number- Isotopes and Isobars - Bohr's Atomic Theory - Orbitals - Shapes of s, p and d orbitals – Aufbau principle - Hund's rule - Pauli's exclusion principle - Electronic configuration of elements.
Chemical Bonding: Introduction – Electronic theory of valency - Types of chemical bonds - Ionic, Covalent, Co-ordinate covalent, Metallic and Hydrogen bonds with examples - Properties of Ionic and Covalent compounds - Types of Hydrogen bonds – Effect of hydrogen bonding on physical properties.
Oxidation-Reduction: Electronic concept of Oxidation, Reduction - Oxidation Number - Calculations.

UNIT-II: SOLUTIONS AND COLLOIDS

Introduction - Solution – Solubility - Classification of solutions based on physical state- Atomic weight, Molecular weight, Equivalent weight - Mole concept – Molarity and Normality - Numerical problems on mole, molarity and normality – Colloids - Types of colloids - Lyophilic and Lyophobic colloids – Protective colloids - Gold number - Properties of colloids - Industrial applications of colloids.

UNIT-III: ACIDS AND BASES

Introduction - Theories of acids and bases and limitations - Arrhenius theory - Bronsted -Lowry theory - Lewis's acid base theory - Ionic product of water - pH and related numerical problems - Buffer solutions-buffer action - Applications of buffer solutions- Ostwald's theory of indicators.

UNIT-IV: ENVIRONMENTAL SCIENCE

Introduction - Environment - Scope and importance of environmental studies - Important terms - Concept

of ecosystem - Producers, consumers and decomposers - Food chain - Food web - Carbon and nitrogen cycles - Biodiversity, definition and threats to Biodiversity - Forest resources - Deforestation – Green Chemistry – E-waste – Management of e-waste.

UNIT-V: WATER TECHNOLOGY

Introduction - Soft and hard water - Causes of hardness – Types of hardness - Disadvantages of hard water using in industries - Degree of hardness - Softening methods - Permutit process and Ion exchange process - Drinking water - Municipal treatment of water for drinking purpose – Osmosis and Reverse Osmosis - Advantages of Reverse Osmosis – Desalination by Electro dialysis – Defluoridation – Nalgonda Technique.

UNIT-VI: ELECTROCHEMISTRY

Conductors, insulators, electrolytes – Types of electrolytes - Arrhenius theory of electrolytic dissociation - Electrolysis – Electrolysis of fused NaCl and aqueous NaCl –Applications of electrolysis - Faraday's laws of electrolysis - Numerical problems.

UNIT-VII : METALLURGY

Characteristics of metals - Distinguish between metals and non-metals - Mineral, Ore, Gangue, Flux, Slag - Concentration of ore - Construction and operation of Reverberatory furnace and Blast furnace - Methods of extraction of crude metal - Roasting, Calcination and Smelting – Alloys - Purpose of making alloys - Composition and uses of Brass, German Silver, Nichrome, Stainless Steel and Duralumin.

UNIT–VIII: CORROSION

Corrosion - Factors influencing the rate of corrosion – Dry and wet theories of corrosion – Composition cell, Stress cell and Concentration cell - Rusting of iron and its mechanism - Prevention of corrosion – Protective coatings - Cathodic protection - Paint – Constituents of paint – Functions of constituents of paint.

UNIT–IX: POLYMERS

Polymers - Polymerization - Types of polymerizations – Addition polymerization and Condensation polymerization - Plastics - Types of plastics - Advantages of plastics over traditional materials - Disadvantages of using plastics - Preparation and uses of the some plastics; 1. Polythene 2. PVC 3. Teflon 4. Polystyrene 5. Urea formaldehyde 6. Bakelite - Compounding and moulding of plastics – Natural rubber – Vulcanization of natural rubber - Elastomers – Preparation and uses of Butyl rubber, Buna-S rubber and Neoprene rubber - Fibres - Preparation and uses of Nylon 6,6 and Polyester (Polyethylene terephthalate) - Biodegradable polymers and their general applications.

UNIT–X: FUELS AND LUBRICANTS

Definition and classification of fuels - Characteristics of good fuels - Calorific value - HCV and LCV - Calculation of oxygen required for combustion of methane and ethane – Preparation method,

composition, calorific value, and uses of some gaseous fuels; a) CNG b) LPG c) Water gas, d) Producer gas, e) Coal gas, and f) Bio gas – Explosives – Classification of explosives – Applications of explosives – Lubricants – Classification and functions of lubricants.

UNIT-XI: ELECTROCHEMICAL CELL AND BATTERIES

Galvanic cell - Standard electrode potential - Reference electrodes - Types of reference electrodes - Electro chemical series - EMF of cells and batteries -Types of batteries - Fuel cells.

UNIT–XII: ENVIRONMENTAL STUDIES

Introduction - Classification of air pollutants based on origin and physical state of matter - Air pollution – Causes, effects and controlling methods of air pollution - Water pollution – Causes, effects and controlling methods of water pollution – Soil pollution – Causes of soil pollution – General effects of soil pollution - Controlling methods of soil pollution – Carbon Trading - Causes and effects - Control measures.

COMPUTER SCIENCE & ENGINEERING (100 Marks)

Unit-I: DIGITAL ELECTRONICS

Number systems–Number conversions– Codes – Logic gates: AND, OR, NOT, NOR, NAND and XOR – Boolean algebra – Boolean expressions – De-Morgan's theorems – SOP and POS forms –K-Map (up to 4 variables)–Digital logic families – TTL, CMOS and ECL–Characteristics of Digital ICs –Combinational Circuits –Adders–Multiplexers and De-multiplexers –Encoders and Decoders – Comparators –Sequential logic circuits –Latches –Flip-flops – Edge andlevel triggering –Registers – Counters –Memories – RAM, ROM, Applications of Flash ROM.

Unit-II: COMPUTER ARCHITECTURE

Functional blocks of Digital computer – Stored program concept – Fixed point, Floating point number representations – Complements –Instruction formats – Addressing modes– Memory hierarchy –Virtual memory, Associative memory – Cache memory – I/O Organization – Modes of data transfer – Programmed I/O, Interrupt initiated I/O, and DMA – Bus system - Parallel processing –Pipeline processing: arithmetic & instruction pipeline –Vector processing – Flynn's classification - RISC and CISC processors.

Unit-III: C PROGRAMMING AND DATA STRUCTURES

Algorithms – Flowcharts – C Tokens – Data types – Operators and expressions – Precedence and Associativity of operators –Type conversions – Preprocessor directive statements–Decision making statements –Looping statements–1D and 2D Arrays –Strings – Functions – parameter passing – Storage classes–Recursion – Structures– Unions – Files

Data Structures– Pointers –Arrays and pointers –Structures and pointers - Memory allocations – Data structures classification –Abstract Data Types – Time and Space complexities–Stacks and Queues –Linked Lists: Single Linked List, Double Linked List– Binary trees – Tree traversal techniques.
Sorting: Bubble, Selection, Insertion, Quick and Merge sorts – Searching: Linear and Binary search techniques.

Unit-IV: OBJECT ORIENTED PROGRAMMING THROUGH C++

OOPs concepts – Keywords of C++ –Classes and objects: array of objects, passing and returning objects, pointer to objects, this pointer– I/O manipulators – File and I/O functions –Constructors and destructors –Function overloading and Operator overloading – Inheritance types: Single, Multiple, Multilevel, Hierarchical, Hybrid and Multipath–Virtual functions – friend functions –inline functions – Templates –Function and class templates.

Unit-V: RELATIONAL DATABASE MANAGEMENT SYSTEMS

Concepts of Database systems–Data abstraction – Data independence, Data models, Entity-Relationship (ER) Model – Structure of Relational database – Keys –Functional dependencies – Normal Forms: 1^{st}, 2^{nd}, 3^{rd} and BCNF –Transactions – ACID Properties –SQL – data types, operators, constraints – Database Languages: DDL, DML and DCL–SQL numeric, aggregate, scalar, date and string functions –JOIN statements– views, sequences, synonyms and indexes – PL/SQL – data types, control statements, functions, procedures, recursion, exceptions, cursor management, triggers, and packages.

Unit-VI: COMPUTER HARDWARE & NETWORKING

BIOS – Components of Motherboard – SMPS –Processors – Memories –Mass storage devices – Input devices– Output devices
Networking – Classification of networks: LAN, MAN, WAN –Network topologies: Bus, Ring, Star, Mesh, Hybrid –OSI reference model, TCP/IP reference model – LAN components: Coaxial, Twisted pair, Optical fiber cables and connectors – Ethernet –LAN devices: Repeaters, hubs, bridges, switches, gateways, NIC, routers, modems –Protocols: HTTP, HTTPS, FTP, SMTP, telnet –TCP/IP addressing scheme – IP address classes – IP Subnetting.

Unit-VII: OPERATING SYSTEMS

Operating System concepts, goals, services, types, system calls – Process Management: PCB, process states, threads – CPU scheduling criteria –CPU scheduling algorithms: FCFS, SJF, Round Robin, Priority, Multilevel scheduling, Multilevel feedback scheduling–Inter Process Communication –Process synchronization – Semaphores – Monitors –Deadlocks: necessary conditions, prevention, avoidance, detection and recovery– Memory Management – Overlays, swapping, fragmentation, paging, segmentation - virtual memory, Demand paging - Page

replacement algorithms: FIFO, LRU, Optimal – Thrashing – Disk scheduling – Disk scheduling algorithms: FIFO, SSJF, SCAN, C-SCAN - File management – file operations, access methods, directory structure.

Unit-VIII: JAVA PROGRAMMING

Java – features, tokens, data types, variables, operators, arrays, selection and iteration statements – Classes and objects – Constructors – Method overloading –Static and final members –string classes and methods –Inheritance types – super, final keywords –Method overriding – Interfaces –Packages – Access specifiers –Applets – AWT – Event handling - Exception handling – Multithreading -JDBC – Servlets.

Unit-IX: PYTHON PROGRAMMING

Python – features, variables, data types, indentation, controls structures, operators, strings and functions – Classes and objects – Constructors – Modules – Packages: math, datetime package– Exception handling – Multithreading: thread module, thread synchronization – GUI using Tkinter package – Geometry managers –Widgets – Regular expressions – File operations – accessing databases using MySQL.

Unit-X: WEB TECHNOLOGIES

Internet fundamentals – HTML, Tags, Attributes, Formatting text – Cascading Style Sheets –XML – Java script: data types, operators, control structures, procedures, functions and arrays – PHP: data types, variables, operators, control structures, strings and string methods, arrays and array methods, functions, classes and objects - Concept of accessing databases – sessions and cookies.

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